

**ALEUROPTERYX JUNIPERI: A EUROPEAN SCALE PREDATOR  
ESTABLISHED IN NORTH AMERICA  
(NEUROPTERA: CONIOPTERYGIDAE)**

THOMAS J. HENRY

Bureau of Plant Industry, Pennsylvania Department of Agriculture,  
Harrisburg, Pennsylvania 17120

**ABSTRACT**—The Palearctic coniopterygid *Aleuropteryx juniperi* Ohm is reported in North America, based on specimens collected July 21, 1968, in south-central Pennsylvania, and 1972–74 in 11 additional counties of Pennsylvania on several species and cultivars of juniper. *Aleuropteryx juniperi* overwintered mainly as second-instar larvae. Adults appeared by the middle of May and oviposited on the undersides of juniper needles in early to mid-June. Adults of the second generation became abundant in late July and in mid- to late August produced eggs that formed the overwintering population. Both larvae and adults were observed to feed on juniper scale, *Carulaspis juniperi* (Bouché), and minute cypress scale, *C. minima* (Targioni-Tozzetti), infesting various *Juniperus* spp. Introduction via nursery stock is considered probable.

*Aleuropteryx juniperi*, recently described by Ohm (1968), has long been confused with the pine-inhabiting *A. loewii* Klapalek, but has been shown to occur mainly on *Juniperus* spp. (Ward, 1970). Meinander (1972) figured head, wings, male and female genitalia and gave Austria, Germany, Great Britain, France and Spain for its distribution. Ward (1970) reviewed the taxonomic history of *A. juniperi* and the subfamily Aleuropteryginae and described the last instar larva. She gave juniper scale, *Carulapsis juniperi* (Bouché), as the probable host for *A. juniperi* and suggested that its association with ornamental junipers may account for its introduction into Britain.

I first reported this coniopterygid new in North America based on specimens collected on *Juniperus* sp. July 21, 1968 at Harrisburg, Pennsylvania, by E. E. Simons and during 1972–74 from 6 additional counties in Pennsylvania (Coop. Econ. Insect Rep., 1974a). A second state record was reported based on specimens collected on juniper July 15, 1974, at Fairfax, Virginia, by R. W. Baumann (Coop. Econ. Insect Rep., 1974b). This paper summarizes my observations on the biology of *A. juniperi* in Pennsylvania.

**METHODS**

Records of seasonal occurrence were obtained through weekly sampling at Harrisburg during May–September, 1974, and general collecting in other areas of Pennsylvania. Ten of 90 globose Hetz junipers were selected randomly for each weekly sample. Since coniopterygids and scales were found to be nearly restricted to the lower branches, the lowest 2' was sampled by tapping the

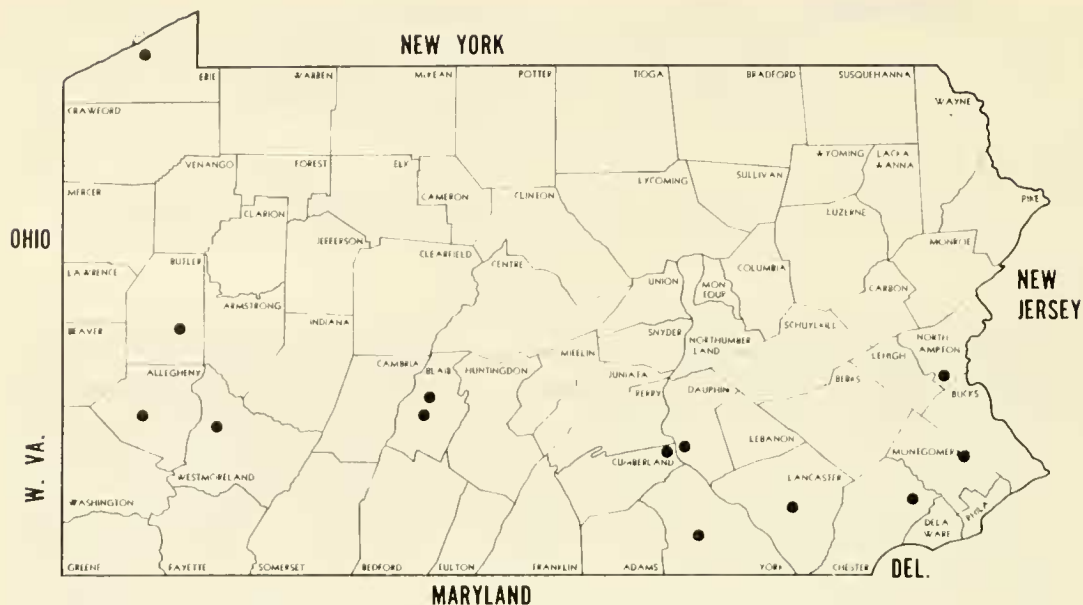


Fig. 1. Distribution of *Aleuropteryx juniperi* Ohm in Pennsylvania.

branches over a 10" × 12" beating tray. Adults were collected with an aspirator, counted and then released.

#### BIOLOGY

This coniopterygid has been collected in 12 counties (fig. 1) on scale-infested branches of andorra juniper, *Juniperus horizontalis* (Moench) Meth. cv. 'Plumosa'; Hetz juniper, *J. chinensis* (L.) Mant. cv. 'Hetzii'; Pfitzer juniper, *J. chinensis* cv. 'Pfitzeriana'; Sargent's juniper, *J. chinensis* var. *sargentii*; and eastern red cedar, *J. virginiana* L. It has been taken in association with 2 species of scale: juniper scale, *Carulaspis juniperi*, and minute cypress scale, *C. minima* (Targioni-Tozzetti). Juniper scale is found statewide, whereas minute cypress scale has been taken only in southcentral and southeastern Pennsylvania (Coop. Econ. Insect Rep., 1974c). All of my observations pertain to *C. minima* because of the convenience of a high local population of both coniopterygid and scale.

There are apparently 3 larval stages of *A. juniperi*. Second-instar larvae overwintered and became active on warm days (45–50°). Larvae were taken from the branches of Hetz juniper infested with minute cypress scale as late as December and early as mid-February. With the return of cold weather, the larvae apparently retreated into the inner branches, or sought protection in the crevices of the rough bark or needles on the outer branches. During cold weather, it became difficult to collect any specimens from the foliage.

Most of the overwintering larvae matured and pupated by the first or second week of May. Adults appeared mainly from mid- to

Table 1. Numbers of *A. juniperi* in 10 beating samples/week at Harrisburg, Pa. during 1974.

	Date	No. of Adults	No. of Larvae
May	31	66*	—
June	12	53	—
	19	16	1
	26	6	—
July	3	1	10
	10	5	23
	17	40	26
	25	65	29
	31	234	45
Aug.	7	192	—
	14	85	29
	21	23	90
	28	2	179
Sept.	5	4	184
	20	0	954*

\* 5 plants/sample; counts adjusted to 10 plants/sample.

late May with the first record April 27 from Hershey, Dauphin Co. The adult population peaked by the first week of June and rapidly declined so that only a few adults were present by early July. First-instar larvae of the second generation appeared during the last week of June; adults by the middle of July. Adults became most abundant in early August and disappeared by the second week of September. The latest record for an adult was October 31 in Harrisburg. First-instar larvae were predominant during early September, and second-instar larvae representing the overwintering population were abundant in late September. They continued to feed on warm days through December.

Weekly samples taken in Harrisburg indicated 2 distinct generations of *A. juniperi* (Table 1). First generation adults reached their highest numbers on May 31; second generation adults peaked on July 31. Larvae were counted beginning in early July, and on September 20 they reached a peak of 476 in 5 samples, or nearly 100 per tray. Counts for larvae may have been low because of the difficulty in sorting them from debris.

Pairing was observed in the field and laboratory (fig. 2). The male and female assume a tail-to-tail position with the female often dragging the male behind. This process lasted for at least 20 minutes.



Fig. 2-4. *Aleuropteryx juniperi* Ohm. 2, tail-to-tail pairing position. 3, egg. 4, larva feeding on *Camilaspis minima* (Targioni-Tozzetti) nymph.

Photographing and transferring to different containers did not seem to disturb mating pairs. Even after rigorous beating, mating pairs were often taken in samples. In contrast to this tail-to-tail pairing, Collyer (1951) described a staggered-parallel position in *Conwentzia pineticola* Enderlein with the male holding onto the hind coxae of the female with its mouthparts and forelegs.

Eggs of *A. juniperi* are 0.4 mm long and oblong-oval with the ventral side slightly flattened. The chorion is brownish and finely faceted. Both field-collected eggs and eggs deposited in the laboratory are generally laid singly and glued to the undersides of the juniper needles (fig. 3). Under crowded laboratory conditions, up to 6 eggs were recovered from a single needle, and occasionally eggs were laid randomly about the stems and sides of the rearing containers.

The larvae (fig. 4) are sluggish and seem to locate their prey only by direct contact. Fleschner (1950) studied the searching capacity of the citrus red mite predator *Conwentzia hageni* Banks (prob. confused with *C. californica* (Meinander, 1972)) and concluded that this coniopterygid detected the presence of its prey only by actual physical contact. Larvae of *A. juniperi* feed at the base of the adult scale insects rather than penetrate the hard outer shell (exuviae and waxy secretions). The mouthparts are inserted to their base with the palpi forced out to a horizontal position. One third-instar larva was observed feeding for 25 minutes on a mature scale. On the softer-bodied scale crawlers and nymphs, penetration is not as critical as with the adult scales; therefore, the larvae fed at more random locations.

When mature, the larva spins a conspicuous white, double-layered silken cocoon. The inner layer is dense and completely covers the pupa; the outer layer is composed of a coarsely-woven mesh of silk that loosely covers the more compact cocoon inside. The cocoons are attached to the terminal stems and are readily visible by examining the undersides of the juniper branches. Upon emergence, the adult forces its way through the fragile cocoon, leaving the pupal skin protruding.

Adults were observed to feed on all stages of minute cypress scale. The crawlers are grasped with the mandibles and entirely consumed. On mature scales, adults chew off the "cap" or hard shell, then proceed to feed on the soft-bodied scale inside.

Adults may also feed on scale secretions. They often stop and appear to feed on the crystal-like residue that coats many of the scale-infested branches. In the laboratory, adults will feed on honey dissolved in water if no scales are present.

It was thought, perhaps, that this coniopterygid would also prey

on spruce mite, *Oligonychus ununguis* (Jacobi), as well as on scale insects. Field-collected adults were placed in control cages containing clean juniper branches, branches infested with spruce mites and branches infested with minute cypress scale. The coniopterygids on the control and mite-infested branches congregated on the sides of the rearing containers and died within 2 days. This test was run repeatedly throughout the season, and adults were never observed to feed on mites or survive more than 2 days. On scale-infested branches *A. juniperi* survived for several weeks and oviposited frequently. To further strengthen the conclusion of the host specificity of *A. juniperi*, adults, starved overnight, were released onto scale-infested branches, mite-infested branches and whitefly-infested leaves of a *Phaseolus* sp. The adults quickly began to feed on the scale insects; they again ignored the mites; and a few adults attempted to chew through the hard covering of whitefly nymphs and pupae but were never successful.

*Aleuropteryx juniperi* probably was introduced into this country on juniper nursery stock. It is documented that living juniper plants infested with juniper scale were brought into southeastern Pennsylvania nurseries from Europe in the early 1900's (Surface, 1915). Unlike many other introduced insects, *A. juniperi* is beneficial and may prove to be important in limiting populations of juniper and minute cypress scale on ornamental junipers.

I am grateful to Dr. Martin Meinander, University of Helsinki, for verifying my determination of *A. juniperi*. Also, thanks to Dr. Alfred G. Wheeler, Jr., Bureau of Plant Industry, Pennsylvania Department of Agriculture, for collecting many of the specimens used in this study and for kindly reading the manuscript and offering suggestions for its improvement; Janene Giomaris and Karen McIntosh, summer employees with the Pennsylvania Department of Agriculture, for their valuable help in making laboratory observations and collections of field samples; and James F. Stimmel, BPI, PDA, for his photographs included in this paper.

#### REFERENCES

- Collyer, E. 1951. The separation of *Conwentzia pineticola* End. from *Conwentzia psociformis* (Curt.) and notes on their biology. Bull. Entomol. Res. 42:555-564.
- Cooperative Economic Insect Report. Plant Protection Division, ARS, USDA. 1974a: 24(33):659; 1974b: 24(35):703; 1974c: 24(45-48):856.
- Flechner, C. A. 1950. Studies on searching capacity of the larvae of three predators of the citrus red mite. Hilgardia. 20(13):233-265.
- Meinander, M. 1972. A revision of the family Coniopterygidae (Plannipennia). Acta Zool. Fennica. 136:1-357.
- Ohm, P. 1968. Vorläufige Beschreibung einer neuen europäischen Aleuropteryxart (Neuroptera, Coniopterygidae). Entomol. Nachrbl. 15:12-15.

- Surface, H. A. 1915. The annual report of the Bureau of Zoology of the Department of Agriculture. pp. 78-99. 20th Ann. Rept., Pa. Dept. Agr.
- Ward, L. K. 1970. *Aleuropteryx juniperi* Ohm (Neur., Coniopterygidae) new to Britain feeding on *Carulaspis juniperi* Bouché (Hem., Diaspididae). Entomol. Mon. Mag. 106:74-78.

---

### BOOK REVIEWS

**Bibliography (1758 to 1972) to the Staphylinidae of America North of Mexico (Coleoptera).** I. Moore and E. F. Legner. 1974. *Hilgardia* 42: 511-563.

**A Catalogue of the Staphylinidae of America North of Mexico (Coleoptera).** I. Moore and E. F. Legner. 1975. Division of Agricultural Sciences, University of California, Special Publication 3015. pp. 1-514.

These two publications are intended for joint usage as the references cited in the Catalogue are listed in detail in the Bibliography. The value of these publications cannot be questioned; as the North American Staphylinidae have not been similarly treated since the Leng catalog (checklist) and its supplements were published. To anyone other than a specialist in the family, the vast number of genera and species has presented an almost insurmountable obstacle to research. Moore and Legner have, to a large degree, removed this obstacle with their Catalogue and the accompanying keys to genera. The Bibliography includes all or nearly all of the references to the taxonomy and biology of the Staphylinidae of America, north of Mexico, through 1972. Keys to the subfamilies and genera of the Staphylinidae are presented which, although unfortunately not illustrated, are the most complete and accurate of any available. The Catalogue includes, in addition to the standard items to be expected in any comprehensive catalogue, references to existing keys to species and references that include illustrations. These illustrations are listed in detail, giving page, plate and figure numbers of each. An indication is also given as to whether the illustration is in toto or of the sexual characteristics of either male or female. When more than one article by an author in the same year is listed, it is not always possible to tell which is being referred to. These references do not have the preferred format of the year followed by a subletter. The type-species of generic synonyms are not listed, and this information would have been useful. These two publications comprise a timely, much needed contribution to the knowledge of North American Staphylinidae.

ROBERT D. GORDON, *Systematic Entomology Lab., IBIII, Agr. Res. Serv., USDA, c/o U.S. National Museum, Washington, D.C. 20560.*